

AD-A031 674

ARMY AVIATION TEST BOARD FORT RUCKER ALA
MILITARY POTENTIAL TEST OF PRIMARY HELICOPTER TRAINERS.(U)
MAY 67

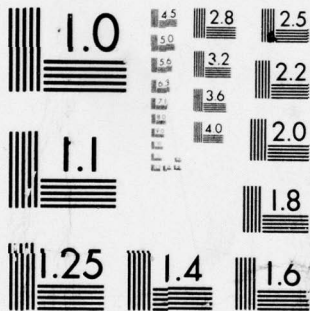
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MICROCOPY RESOLUTION TEST CHART
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DEPARTMENT OF THE ARMY
UNITED STATES ARMY AVIATION TEST BOARD
Fort Rucker, Alabama 36360

1 NW

11/23 May 67

STEBG-TD

MAY 23 1967

SUBJECT: First Partial Report of Test, Military Potential Test of
Primary Helicopter Trainers, RDT&E Project No. _____
USATECOM Project No. 4-7-1000-01

(9) Partial rept. no. 1.

TO: See Distribution

DDC
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1. References.

12 24p. A 27

a. Letter, AMSAV-O, Headquarters, US Army Aviation Materiel Command, 13 December 1966, subject: "Flight Testing, Primary and Instrument Helicopter Trainers."

b. Letter, AMSTE-BG, Headquarters, US Army Test and Evaluation Command, 3 January 1967, subject: "Test Directive, Military Potential Test, Primary and Instrument Helicopter Trainers."

c. Message, AMSAV-O-O 02-19007, Commanding General, US Army Aviation Materiel Command, 21 February 1967, subject: "Confirmation of Guidance from USAAVCOM."

d. Letter, AMSAV-PAIRO, Headquarters, US Army Aviation Materiel Command, 24 February 1967, subject: "re: IFB No. DAAJ01-67-B-0328(O) (Step One), " with four inclosures: Annex A, "General

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SUBJECT: First Partial Report of Test, "Military Potential Test of Primary Helicopter Trainers," RDT&E Project No. _____, USATECOM Project No. 4-7-1000-01

Specification for Helicopter, Primary Trainer;" Annex B, "Plan of Test, Helicopter, Primary Trainer;" Annex C, "Required Content of Technical Proposals;" and Annex D, "Format of Proposed IFB (Step Two)."

e. First Partial Report of Test, USATECOM Project No. 4-7-1000-02, "Military Potential Test of Basic Rotary-Wing Instrument Trainers," US Army Aviation Test Board, 30 March 1967.

f. Plan of Test, USATECOM Project No. 4-7-1000-01, "Evaluation of Commercial 'Off-the-Shelf' Helicopters as Primary Helicopter Trainers," US Army Aviation Test Board, undated.

2. Background.

a. On 3 January 1967, the US Army Test and Evaluation Command directed the US Army Aviation Test Board (USAAVNTBD) to conduct a military potential test of commercial off-the-shelf primary helicopter trainers to assist the US Army Aviation Materiel Command (USAAVCOM) during evaluation of the first-step proposals (reference 1b). Helicopter A was received for test on 26 March 1967 and testing was initiated on 27 March 1967. Flight and ground tests were completed on 3 April 1967. Total flight time was 18.0 hours including mission suitability tests conducted by the US Army Primary Helicopter School, which will be reported through US Continental Army Command channels.

b. Personnel of the US Army Board for Aviation Accident Research (USABAAR) conducted a safety evaluation of the helicopter.

3. Description of Materiel.

a. Helicopter A has a fully articulated, three-bladed main rotor and a two-bladed antitorque rotor. It is powered by a 205-horsepower (Lycoming Model HIO-360-C1B), fuel injection, four-cylinder reciprocating engine. The two-place helicopter has side-by-side seats and dual flight controls. The skid-type landing gear uses air-oil struts to absorb

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landing shock. The cabin area is covered with a skin of laminated fiber-glass and reinforced plastic. The skin of the semimonocoque tail boom is aluminum. The engine drives the rotor system through a multiple-groove belt system and is manually engaged and disengaged by a lever located between the seats. A sprag overrunning-type clutch disengages the rotor for autorotation. Two side panels are removable to allow access to the horizontally mounted engine.

b. The weights and dimensions of Helicopter A are:

- | | |
|-----------------------------------------------------------------------------------------|---------------------------|
| (1) Empty weight | 1,472 pounds |
| (2) Fuel capacity (100/130
AVGAS) | 33.8 gallons (203 pounds) |
| (3) Oil capacity (SAE 40) | 8 quarts (15 pounds) |
| (4) Mission gross weight | 2,050 pounds |
| (5) Maximum certified gross
weight | 2,150 pounds |
| (6) Rotor diameter | 32 feet |
| (7) Maximum length of heli-
copter with main-rotor
blade forward | 36 feet, 6 inches |
| (8) Width of cabin interior | 4 feet, 10 inches |
| (9) Height of main rotor
above ground, minimum,
fuselage level (non-
rotating) | 6 feet |

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USATECOM Project No. 4-7-1000-01

(10) Height of main rotor 8 feet, 4 1/2 inches
 above ground, mission
 gross weight, flat pitch,
 313 rotor r.p.m., cyclic
 centered

(11) Maximum height, ground 9 feet
 to top of mast

4. Objective. To determine whether the test helicopter meets
those requirements in paragraph 3 of the General Specification which
are determined to be testable.

5. Test Criteria. Annex A of reference 1d was the test criteria
for this evaluation.

6. Summary of Results. Subparagraphs and appendices contained
in paragraph 3 of the General Specification (reference 1d) which were
determined to be testable and were investigated are listed in inclosure 1.

a. The test helicopter met the requirements in the following
subparagraphs of the General Specifications:

3.1.2.2.a	3.2.12	3.10.4	3.13.1.6
3.1.2.2.b	3.4.6	3.12.12	3.13.1.9
3.1.3	3.5.1.2	3.12.15.4	3.13.1.12
3.1.4	3.5.1.8	3.12.15.5	3.13.1.13
3.1.6	3.6.1.7	3.12.15.6	3.20.d
3.2.1	3.8.1	3.13.1.3	3.21
3.2.4	3.8.3	3.13.1.4	3.24.a
3.2.10	3.10.3	3.13.1.5	3.24.c

b. The following configuration requirements (other than avionic
equipment) were not met:

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USATECOM Project No. 4-7-1000-01

<u>General Specification Paragraph Number</u>	<u>Description</u>	<u>Remarks</u>
3.5.1.5	Blade folding provisions.	Not provided.
3.5.1.6	Rotor-blade tiedown equipment.	Not provided.
3.7.1.3	Shoulder harness and inertia reel.	Not provided.
3.7.1.3	Internal and external emergency release for crew compartment doors.	Not provided.
3.7.1.3	All around undistorted visibility.	Visibility was restricted upward and to lower front.
3.7.1.3	Data case.	Not provided.
3.7.1.3	Generally conform to MIL-STD-250B:	
	a. Abbreviated takeoff and landing checklist.	Not provided.
	b. Single control to adjust both pedals.	Not provided.
	c. Induction system air control located to left of mixture control (accessible to both pilots).	Control was located to left of the left pilot's seat and could not be reached by both pilots.

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Primary Helicopter Trainers," RDT&E Project No. _____,
USATECOM Project No. 4-7-1000-01

General Specification

<u>Paragraph Number</u>	<u>Description</u>	<u>Remarks</u>
	d. Landing light switch located on forward end of collective pitch control.	Switch was located on instrument panel.
3.10.1	Adjustable friction devices on collective and cyclic controls.	Not provided.
3.12.8	Engine chip detector warning light.	Not provided.
3.12.15	Main-rotor transmission chip detector warning light.	Not provided.
3.13.1.1	28-volt electrical system.	A 12-volt system was provided.
3.13.1.1.1	Battery quick-disconnect connector per MS25182.	Not provided.
3.13.1.2	A 28-volt d. c. power source.	A 12-volt power source was provided.
3.13.1.7	External power receptacle.	Not provided.
3.13.1.10	Instrument light dimming controls.	Not provided.
3.13.1.11	Amber warning lights or annunciator panel.	Not provided.

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USATECOM Project No. 4-7-1000-01

General Specification
Paragraph Number

Description

Remarks

3.13.1.14	Landing light switch on both pilots' cyclic controls.	Switch was located on instrument panel. Manufacturer's detail specification did not state a location for the switch.
3.15	Mission and air traffic control system.	Not provided in accordance with SCS-304.
3.20.a	Jacking points on fuselage.	Not provided.
3.20.b	Mooring points.	Not provided.
3.20.c	Hoisting lug on rotor head.	Not provided. (Separate hoisting provisions were provided.)
3.24.d	Defrosting and defogging provisions.	Not provided.
3.26.1	Fire extinguisher.	Not provided.
3.26.2	First-aid kit.	Not provided.

c. None of the avionic equipment listed in the following criteria appendices were provided:

Appendix I-A, sections I and II

Appendix I-C, section II

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d. Ambient conditions during the test period did not reach those specified in the performance requirements of paragraph 3.1.2.2; therefore, the required performance characteristics could not be determined at the specified conditions. Flights were conducted at prevailing weather conditions and the following were determined:

<u>Paragraph</u>	<u>Condition</u>	<u>Result</u>
3.1.2.2.c	Endurance, at 65 knots, 1000 ft. pressure altitude, outside air temperature (OAT) 18°C., mission gross weight, no fuel conservation.	2.5 hours (fuel consumed, 27 gallons).
3.1.2.2.d	Hover out of ground effect, mission gross weight, OAT 11°C.	3,800 feet pressure altitude.
3.1.2.2.f	Rate of climb, normal rated power (takeoff power), 500 ft. pressure altitude to 1,550 ft. pressure altitude, OAT 24°C., mission gross weight.	1,050 feet/minute (Normal rated power and takeoff rated power were equal.)
3.1.2.2.1	Autorotational speed at 330 rotor r.p.m., 500 ft. pressure altitude, OAT 20°C.	45 knots true airspeed.
3.1.2.2.m	Rate of descent, autorotation, 330 r.p.m., 45 knots true airspeed, 1,250 ft. pressure altitude, OAT 17°C.	1,500 feet/minute.

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USATECOM Project No. 4-7-1000-01

<u>Paragraph</u>	<u>Condition</u>	<u>Result</u>
3.1.2.2.n	Maximum altitude required to regain autorotation r.p.m., from 313 r.p.m. to 330 r.p.m., 1,000 ft. pressure altitude, OAT 20°C.	170 feet.

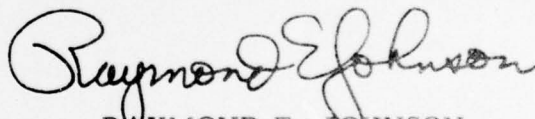
e. Ambient temperatures did not reach 0°F. during the test period, and the capability of the heating system to meet the requirements of paragraph 3.24.b could not be determined.

f. Inclosure 2 is USABAAR's safety evaluation report.

g. Inclosure 3 contains required minimum information to be provided with the test helicopter in accordance with Annex A, reference 1d.

7. Conclusion. None.

8. Recommendation. None.



RAYMOND E. JOHNSON
Colonel, Artillery
President

4 Incls

1. Test Data
2. USABAAR Report
3. Supplemental Information
4. Manufacturer's Code Sheet

DISTRIBUTION:

Commanding General
US Army Aviation Materiel Command
ATTN: AMSAV-O (Mr. Hendrickson)
P.O. Box 209, Main Office
St. Louis, Missouri 63166

5 cys

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USATECOM Project No. 4-7-1000-01

Commanding General 5 cys
US Army Materiel Command
ATTN: AMCMI (Mr. Riesnyder)
Washington, D. C. 20315

Commanding General 2 cys
US Army Test and Evaluation Command
ATTN: AMSTE-BG
Aberdeen Proving Ground, Maryland 21005

Commanding General 5 cys
US Continental Army Command
ATTN: DCIT-SCH-PD
Fort Monroe, Virginia 23351

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USABAAR SAFETY EVALUATION

USABAAR conducted a safety evaluation of a similar helicopter of the same model designation during the Military Potential Test of Basic Rotary-Wing Instrument Trainers, USATECOM Project No. 4-7-1000-02. Some changes have been made in the helicopter since that evaluation. To clarify USABAAR's evaluation report of the primary helicopter trainer, their previous evaluation report has been included herein.

INCLOSURE 2

2-1

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DEPARTMENT OF THE ARMY
UNITED STATES ARMY BOARD FOR AVIATION ACCIDENT RESEARCH
FORT RUCKER, ALABAMA
36360

BAAR-E

14 APR 1967

SUBJECT: Evaluation of Basic Helicopter Trainer - Test Helicopter A

TO: President
US Army Aviation Test Board
ATTN: Basic Helicopter Trainer
Project Officer
Fort Rucker, Alabama 36360

1. USABAAR conducted a safety evaluation of helicopter A on 28 March. This helicopter is the same configuration as Basic Helicopter Instrument Trainer A previously evaluated by USABAAR with the exceptions of dual controls, the center seat removed, and the fiberglass covers over the seat frame removed.

2. These minor changes will have no effect on the crashworthiness and the evaluation expressed in letter BAAR-E, dated 14 March 1967, subject: Evaluation of Basic Helicopter Instrument Trainer - Test Helicopter A.

for *Warren R. Williams, Jr.*
WARREN R. WILLIAMS, JR.
Colonel, Infantry
Director

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DEPARTMENT OF THE ARMY
UNITED STATES ARMY BOARD FOR AVIATION ACCIDENT RESEARCH
FORT RUCKER, ALABAMA
36360

BAAR-E

14 MAR 1967

SUBJECT: Evaluation of Basic Helicopter Instrument Trainer -
Test Helicopter A

TO: President
US Army Aviation Test Board
ATTN: Basic Helicopter Instrument
Trainer Project Officer
Fort Rucker, Alabama 36360

1. The following is USABAAR's evaluation of test helicopter A.
2. Configuration requirements which were not met by entry A and are listed in paragraph 5c of basic report are not repeated here except for emphasis.
3. The crashworthiness of entry A is very suspect. No data was available which provided manufacturer's information relative to structural and/or component crashworthiness. Based upon accident statistics of similar helicopters and a comparison of the structures involved, it is anticipated that under moderate impact conditions injury producing failures will occur in the transmission support assembly, skid attachments, and cabin seat structure.
4. The occupant restraint system is unsatisfactory. There were no shoulder harnesses nor inertia reels installed. The seat belt attachment was very weak and, most likely, would be the first link in the tiedown chain to fail under impact conditions.

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BAAR-E

SUBJECT: Evaluation of Basic Helicopter Instrument Trainer - Test
Helicopter A

5. Entry A has foam rubber seat cushions installed. Test data show that this type cushion amplifies force levels rather than attenuating force during impact conditions.

6. The cockpit doors have no emergency release provisions.

7. The fuel tanks are in a location which, experience shows, make them vulnerable to puncture by structural components during crash conditions. The fuel caps did not have positive locking features.

8. The engine exhaust is in a position which may create ground fires when landing on other than prepared surfaces.

9. The anti-torque pedals do not allow adequate adjustment for "tall man" comfort.

Warren R Williams Jr
WARREN R WILLIAMS, JR

cfm
Colonel, Infantry

Director

GEORGE E. HANDLEY JR

Colonel

Arty

Actg Director

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SUPPLEMENTAL INFORMATION

This inclosure will not be distributed outside the Department of Defense.

This inclosure contains the required minimum information to be provided with the test helicopter in accordance with Annex A to Letter, AMSAV-PAIRO, Headquarters, US Army Aviation Materiel Command, 24 February 1967, subject: "re: IFB No. DAAJ01-67-B-0328(O) (Step One)." A certificate of delivery, departure information, photographs, and a summary of pilot comments are included. Since this material would serve to identify the helicopter model and manufacturer, it will not be distributed outside the Department of Defense.

INCLOSURE 3

3-1

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CERTIFICATE

The undersigned do certify that the Enstrom
Manufactures Name

did deliver a F-28 to Cairns Army Airfield at
Model Number

1230, 26 MARCH 1967, for the purpose of
Time Date

evaluation under the terms of IFB No. DAAJ01-67-B-0378(0)(STEP ONE).

Matthew E. Stausberg
Signature - Manufacture Representative

CW2 - Richard D. Lepore
Signature - USAAVNTBD Representative

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The United States of America

Federal Aviation Agency

Type Certificate

Number H1CE

This certificate, issued to R. J. Enstrom Corporation certifies that the type design for the following product with the operating limitations and conditions therefor as specified in the Civil Air Regulations and the Type Certificate Data Sheet, meets the airworthiness requirements of Part 6 of the Civil Air Regulations.

Helicopter Model F-28

This certificate, and the Type Certificate Data Sheet which is a part hereof, shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Agency.

Date of application: October 5, 1962

Date of issuance: April 15, 1965

Class I Provisional Approved November 14, 1963

Class I Provisional Canceled April 15, 1965

By direction of the Administrator:

(Signature) John A. Carran
John A. Carran
(Title) Chief, Engineering and Manufacturing Branch

This certificate may be transferred if endorsed as provided on the reverse hereof.

Any alteration of this certificate and/or the Type Certificate Data Sheet is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

Form FAA-331 (3-59)

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R. J. Enstrom



Corporation

M E N O M I N E E

M I C H I G A N

ROTORCRAFT FLIGHT MANUAL

Enstrom Model F-28

THIS DOCUMENT MUST BE CARRIED IN AIRCRAFT AT ALL TIMES.

This helicopter must be operated in compliance with the operating limitations set forth in Section I of this Manual.

Registration No. 24

(COVER PAGE)

Approved by: *Paul Helark*

Chief,
Engineering & Mfg. Branch
Flight Standards Division
Central Region
Federal Aviation Agency

Enstrom No. 28 AC 006

Date: APRIL 15, 1965

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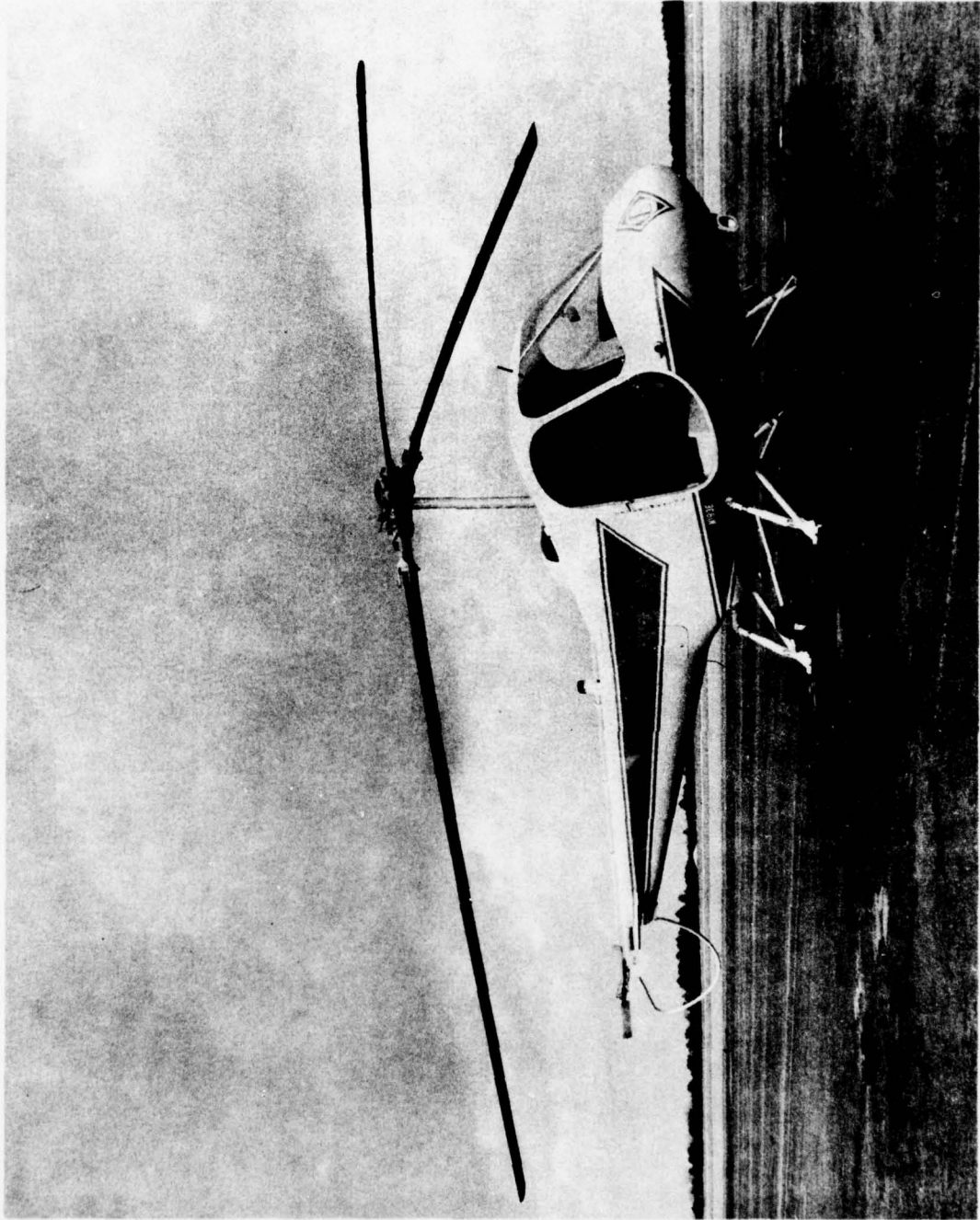


Figure 1. Enstrom F-28 Helicopter

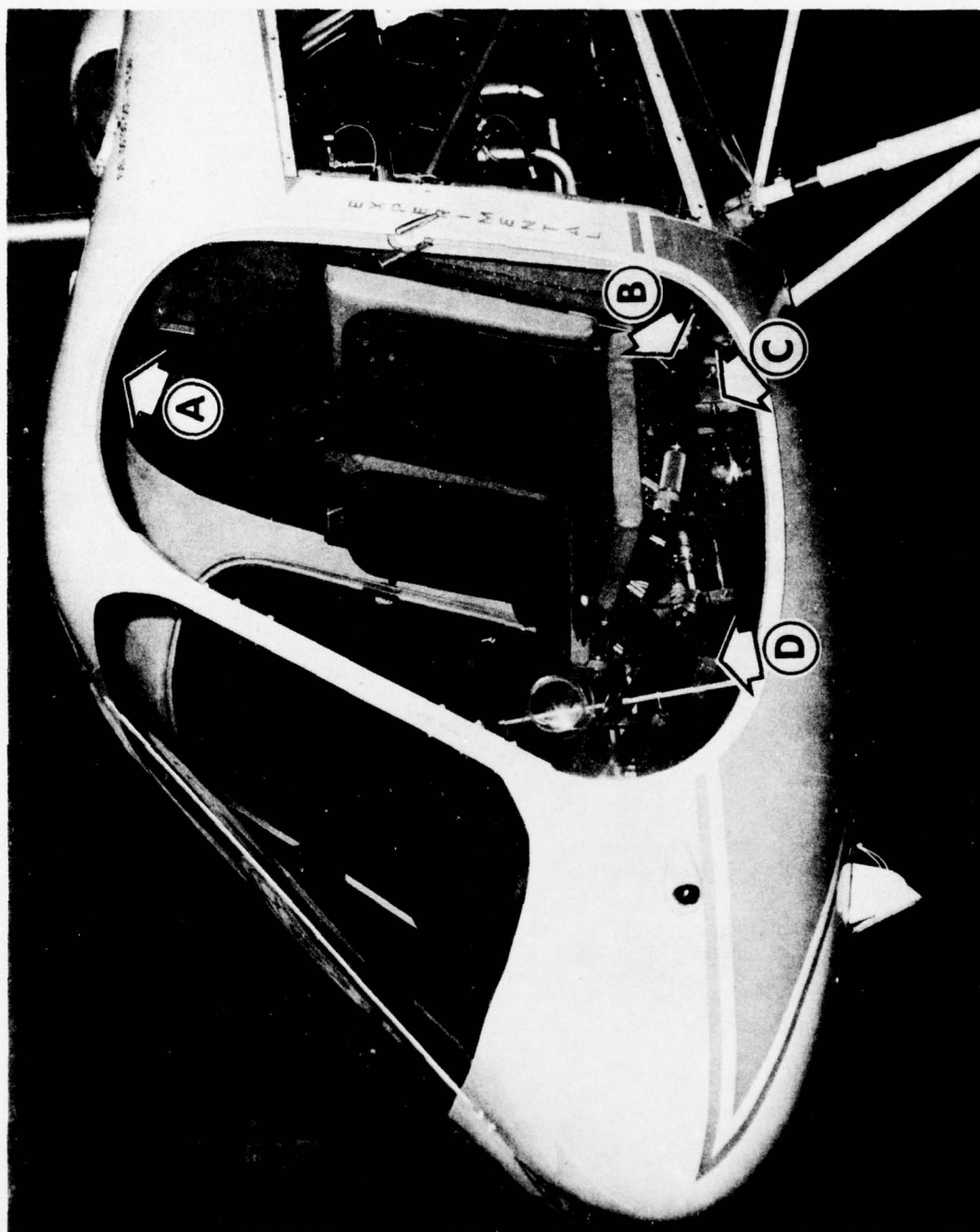


Figure 2. Crew Compartment View
A: Instrument Illumination Light Location
B: Alternate Air Control
C: Heater Control
D: Rotor Engagement Clutch Handle

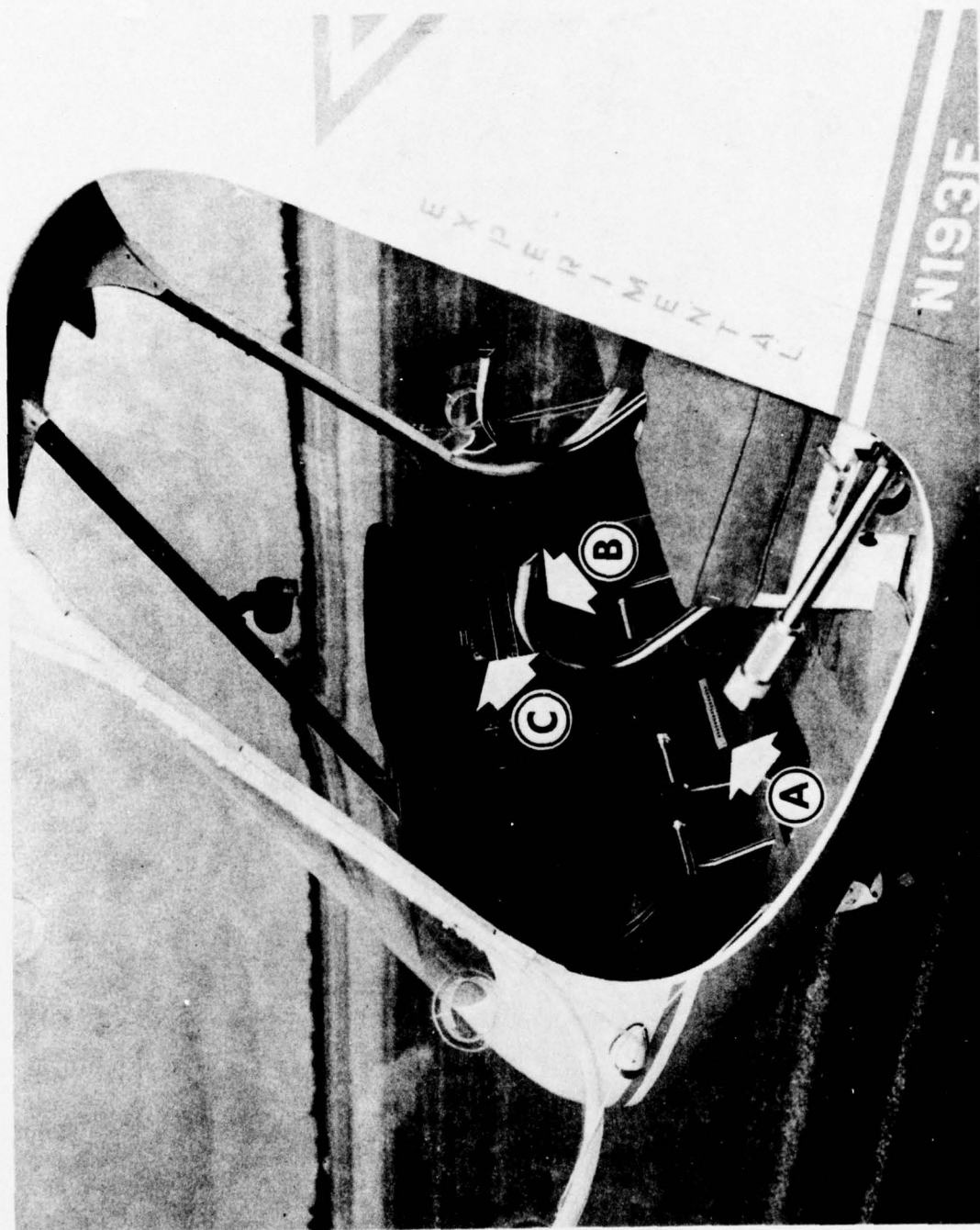


Figure 3. Instrument Panel View

A: Heater Outlet

B: Mixture Control

C: Combination Magneto and Starter Switch

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A type inspection report was furnished. The manufacturer's representative stated that a copy was sent to USAAVCOM.

Weight and balance information follows:

As weighed	1,472 pounds	
Mission fuel	162 pounds actual	
Oil	15 pounds	
Crew	300 pounds	
Ballast (crew)	<u>100</u> pounds	
Mission weight	2,049 pounds	
C. g. location at mission gross weight		Station 92.5
C. g. limits		Stations 92.0 to 98.0

The ease of maintenance was rated as excellent. Unscheduled maintenance performed during the test period consisted of replacement of a spark plug lead which failed.

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CWO Szczepanski/bm/4990

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X

ROUTINE
ROUTINE

PRES USAAVNTD FT RUCKER ALA

CG USAAVCOM ST LOUIS MO

INFO: CG USATECOM APG MD

UNCLAS STEBG-TD-A 4-18 FOR SMOSM-T (Mr. Hendrickson)

USATECOM FOR AMSTE-BG

SUBJECT: Primary Helicopter Trainer, USATECOM Project

No. 4-7-1000-01

Enstrom personnel and equipment departed Fort Rucker,
Alabama, 0900 hours, 4 April 1967. Evaluation Completed.

MEMORANDUM FOR RECORD:

5 April 1967

This correspondence is considered self-explanatory.

RICHARD D. SZCZEPANSKI
CWO W2, Project Officer

Copies furnished:

Director of Test

Chief, P&PO

Chief, Aircraft Test Division

Files Reference Area

5 22/22
April 1967
1 1

4990

DANIEL G. TRAVER, LtCol
Chief, Aircraft Test Division
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H. R. NUTT, 2LT, AGC, Adjutant

3-9

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The following shortcomings were derived from pilot comments compiled during the evaluation.

- a. The cyclic and collective control forces required were greater than optimum.
- b. The pedal adjustment range was insufficient to provide optimum comfort for tall pilots.
- c. The doors were difficult to latch from inside.
- d. The door restraint devices lacked adequate strength to prevent damage to the door in high winds.
- e. Only one heat outlet, located on the crew compartment floor, was provided for heating, defrosting, and defogging.
- f. The instrument lighting system was inadequate--a single map light located on the aft bulkhead was the only source of illumination for the instruments.

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